CRES®

CENTER FOR REPRODUCTION OF ENDANGERED SPECIES

REPORT

SUMMER 2001

Tracking the Elusive Taguá

By Michael Wallace, Ph.D., Wildlife Scientist, Ecology and Applied Conservation Division/CRES

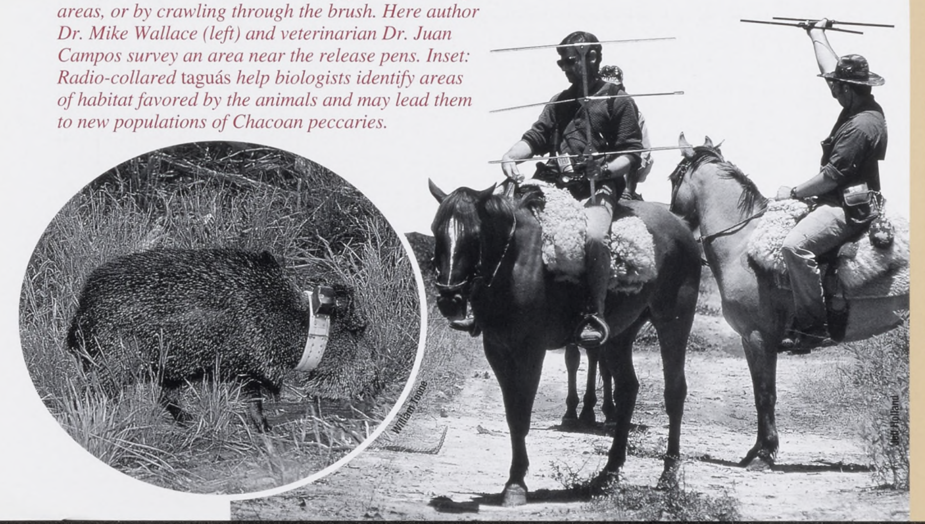
What impresses a biologist when traveling along the Trans Chaco Highway, which cuts through this Paraguayan ecosystem, is the variety and abundance of species. The harsh environment of the Chaco, with its spines, poisonous plants, insects, and snakes, along with extreme periods of alternately hot wet or hot dry seasons, has apparently limited human development while maintaining a haven for its indigenous wildlife. A harsh habitat for people can protect, even conceal, species like the *taguá*, or Chacoan peccary.

Before 1972, there were only two species of peccary in the taxonomic literature: the collared and the white-lipped. Known to science only by a subfossilized jaw bone, the *taguá* was "rediscovered" by biologist Ralph Wetzel and his colleagues not far off the Trans Chaco Highway in central Paraguay. By 1985, Dr. Kurt Benirschke, founding director of CRES, had established a *taguá* breeding station at Toledo, on the outskirts of Filadelfia, a Mennonite colony that has cleared large tracts of land for farming. But to the north, large cattle ranches exist among areas of pristine Chaco habitat. Studies by Zoological Society researchers in physiology, veterinary medicine, animal nutrition, and behavior contributed to this successful breeding project where more than 350 Chacoan peccaries have been born to date.

The next step was to release many of these animals to the wild at various sites; however, it was exceedingly difficult to determine their fate once they dispersed in the dense, spiny thicket of the Chaco. Then in 1999, Bill Toone, conservation project specialist with the Ecology and Applied Conservation Division of CRES, and I began preparations for *taguá* release experiments using radiotelemetry and Global Positioning System (satellite) telemetry to determine where they roamed. We also hoped to develop methods that might give the *taguás* better survival skills in the wild.

A 3,000-acre ranch named Samuu, owned by Dr. Antonio Cubilla and his wife, Pasita, was chosen to conduct our *taguá* release experiments. It lies 14 miles east of the Gran Chaco Highway, at the southwestern edge of what seems to be an endless expanse of Chaco. By sitting on the hood of the truck with someone driving slowly down the winding dirt roads, it is not difficult to identify

Continued on page 2



Tracking taguás *is never easy in the dense scrub of the Chaco, so it's done on horseback, by flying over large areas, or by crawling through the brush. Here author Dr. Mike Wallace (left) and veterinarian Dr. Juan Campos survey an area near the release pens. Inset: Radio-collared* taguás *help biologists identify areas of habitat favored by the animals and may lead them to new populations of Chacoan peccaries.*

William Toone

Jeff Holland

CRES® is operated by the Zoological Society of San Diego.

New Chromosome Imaging System at CRES

Chromosome maps can solve genetic puzzles for species like Siberian tigers. See page 3.

JoAnn B. Weedon CRES Educational Fund Established

New internships for college students this summer. See page 5.

Save the Date for Celebration!

The Zoo's Swingin' Safari is set for September 22. See back cover.

Tracking the Elusive Taguá

Continued from page 1

numerous large cat, peccary, or tapir tracks. With all three peccary species, white-lipped, collared, and Chacoan, it can be a challenge identifying the subtle differences in tracks, and you find yourself searching for the perfect mud or sand imprint. The tapir and the two large animal predators, the cougar and jaguar, frequent the area enough to be seen occasionally.

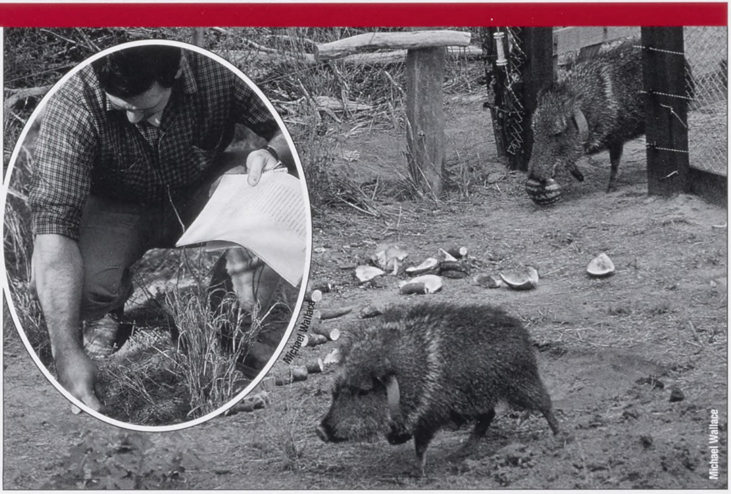
The Samuu ranch is an ideal location for releasing *taguás* bred at the CRES facility in Toledo. It is remote but with considerable wildlife still present and is adjacent to uninterrupted Chaco for hundreds of miles. In the fall of 1999, we hired veterinarian Dr. Juan Campos, who grew up on his father's ranch in northern Paraguay and speaks the indigenous dialect of Guarani. Next we set up the first of two staging and release pens, 75 feet square, just 328 feet off a little-used dirt road of the hacienda in natural Chaco habitat. Since the inception of the program in November 1999, we have released 12 animals in two groups at about one year apart, with the second group freed on January 21, 2001. In preparation for their trip to the release pen, the *taguás* were taken from the colony pens in Toledo, weighed, and fitted with tracking collars. Finally, each received injections to combat any internal parasites they may be carrying and blood samples were taken to ensure they were clear of foot-and-mouth and other diseases before mixing with the wild population.

With the help of botanist Dr. Fatima Mereles, we investigated how the *taguás* would adjust to a diet in the wild by labeling all of the plants within their reach to see what they might try first. We were able to assess their preference by checking what was tasted each day, besides their usual diet of melons, squashes, pumpkins, and a commercially prepared pig ration. It was fascinating to see how they could ingest poisonous plants like *Capparis speciosa* and handle spiny cactus pads by first rolling them around with their snout and knocking off the points before eating them.

The radio-transmitter collars allowed us to track the *taguás* at distances of a few miles, and we had them redesigned for the second release. Two of the collars had the additional ability to act as GPS transreceivers that could collect their positions using satellites twice a day and store the data in the unit. Once a month, the GPS unit was programmed to send its information via a radio signal to a computer/receiver on board a Cessna we hired to fly over the area. As it turned out, the first *taguá* group was quite sedentary, generally staying within a mile of the release pen.

While the first release met with mixed results, the second release has so far fared better. This time, once released, the group split into two and headed in different directions, traveling farther and moving in and out of range. One exciting piece of information is that one of the released females gave birth in the wild and the youngster seems to be doing fine, with the parents and the piglet returning occasionally to the release pen for the pumpkins. We hope to continue to study these peccary pioneers over the next months as they adjust to their new, wild surroundings.

While our project focuses on *taguás*, we are also tracking two wild white-lipped peccaries and have traps set out for a jaguar in the area that we would like to fit with a transmitter. By studying the behavior and movements of these large vertebrates and piecing together the ecological puzzle of this little known ecosystem, we can provide valuable information to the Paraguayan wildlife authorities with whom we coordinate and work. Armed with a better understanding of how their environment works should help Paraguayans better manage this extensive and fascinating ecosystem known as the Chaco.



Before the taguás *are released into wild habitat, they are acclimated in large pens where they form social bonds and begin to forage on natural vegetation. Inset: Dr. Juan Campos helped inventory the plants in the pens, which helps researchers learn about the* taguás' *food preferences.*

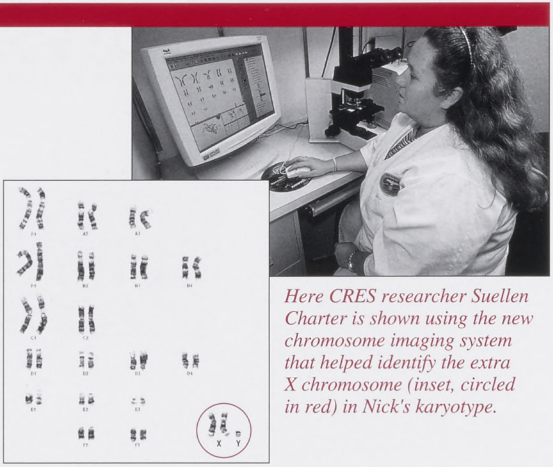
Special Speakers: Field Conservation Projects

Find out how friends and members of the Zoological Society of San Diego help support conservation projects around the world and hear experts in the field giving in-depth information about what it is like to help animals in the wild.

On June 20, reintroduction specialist Dr. Mike Wallace will discuss the steps taken to study, preserve, and increase the population of peccaries in the Gran Chaco.

This program includes a slide presentation, cookies, and a hot beverage. The fee for a Special Speakers program is $12 per person, ages 12 and up. Each program takes place at the San Diego Zoo's Otto Center auditorium from 7 to 8:45 P.M. Reservations are required—call (619) 557-3969 for a brochure and registration form.

New Computer Helps Solve Chromosome Puzzles



Here CRES researcher Suellen Charter is shown using the new chromosome imaging system that helped identify the extra X chromosome (inset, circled in red) in Nick's karyotype.

There seemed to be nothing unusual about the sample that arrived from the Kansas City Zoo one day last spring. A routine skin biopsy taken on a male Siberian tiger, Nick, during his annual health exam was sent to the cytogenetics lab at CRES, so that the cells could become part of the living Frozen Zoo® collection. With the help of a new computer system, we would soon discover that Nick had a very unusual genetic abnormality.

Studying the chromosomes of rare and endangered species is similar to solving a puzzle. Every week, researchers in the cytogenetics lab can be found meticulously pairing the chromosomes of taxa as diverse as fruit bats, gorillas, sifaka lemurs, and okapis to create karyotypes, or chromosome maps, specific to each species. These karyotypes reveal important information, such as the normal diploid chromosome number for a species, distinct differences that distinguish subspecies, and the presence—or absence—of genetic abnormalities in an individual.

On any given day, cells from 50 to 100 animals can be found growing in incubators in the cytogenetics lab. The cells are derived from small skin biopsies taken opportunistically during routine health exams and then sent to CRES from participating zoos throughout the United States, as well as from field research sites that include Argentina, Oman, Zimbabwe, and Madagascar. Several weeks later, the cells have multiplied sufficiently and are then preserved in the Frozen Zoo® where they remain in a state of "suspended animation" indefinitely and are made available for a variety of research projects. As part of the documentation process, each cell line is karyotyped to verify the sex and species. Occasionally, we find something unexpected, as in Nick's case.

Just before Nick's biopsy arrived in the lab, we acquired an innovative, multifunctional imaging system that allows computerized image capture, karyotyping, and archiving of chromosomes for any species. Similar systems for clinical analyses of human chromosomes have been available for several years, but because of the diversity of our animal samples, we required a system with the versatility to accommodate more than 375 species/subspecies with chromosome numbers ranging from 6 to 84! We were one of the first labs to use the newly developed software.

Before we acquired this computerized imaging system, each karyotype was produced by a labor-intensive process that involved photographing the cells on 35mm film, developing and printing the film, and then cutting and pairing each chromosome manually. The new automated system allows much more rapid processing and analysis of the data, in part by eliminating the darkroom work, so it was possible to quickly see that Nick had 39 chromosomes instead of the expected 38 that is normal for tigers. Next, using the mouse instead of scissors, the chromosomes were paired according to distinct banding patterns and arranged into a karyotype—all on the computer screen.

It soon became clear that Nick's extra chromosome was a second X, one of the two types of sex chromosomes. This 39,XXY abnormality, never before documented in an exotic felid, meant that Nick was sterile, an unexpected finding that provides critical information for the Siberian tiger captive-breeding program. The efficiency of the imaging system makes it possible to produce and analyze data, as in Nick's case, in about half the time that the manual method required. In addition, the digital karyotypes can now be sent instantly by e-mail without reducing the resolution of the detailed chromosome banding that is critical for accurate analyses.

Perhaps one of the most important advantages gained from this computerized system is the ability to archive our unique karyotype collection, one of the largest of its kind. Previously, each manually produced karyotype was organized by species and stored in one of over 100 black binders. This storage method not only requires a great deal of space but also makes the irreplaceable collection vulnerable to loss by fire. The new imaging system now makes it possible to archive hundreds of karyotypes on a single DVD disc, which can then be duplicated and stored in several locations for safekeeping.

Without the advanced technology provided by this unique imaging system, researchers in the CRES cytogenetics lab would not be able to perform karyotype studies on as many animals, and surprising findings like Nick's genetic abnormality could go undetected. We've come a long way from the early days of CRES in the 1970s, and this new technology is a great tool for solving chromosome puzzles of rare and endangered species.

–Marlys Houck, Associate Researcher, Cytogenetics/CRES

Conservation Education in the Paraguayan Chaco

The Zoological Society of San Diego has been working for the last 20 years on raising and releasing the endangered Chacoan peccary in one of the most unique yet threatened habitats in the world, the Chaco of Paraguay. This region extends from western Paraguay into Bolivia and Argentina, with an ecosystem comprised of dry woods, savannas, swamps, rivers, and lagoons. It is home to numerous large mammals such as the endangered giant anteater, along with bird species such as the jabiru storks and king vultures, as well as seven endemic bird species that live nowhere else in the world.

Temperatures of 122 degrees Fahrenheit have given the Paraguayan Chaco the disagreeable name "the green hell." But while the Chaco presents a harsh environment for humans, it makes a perfect home for wildlife. The seasonal rains provide food for migratory birds and other wildlife species, while its landscape of thorny bushes, cacti, and spiny bromeliads presents challenges for humans but not for the animals that have adapted to the habitat.

Within the harsh environment of the Paraguayan Chaco live three distinct communities: 13 indigenous tribes (53%), Canadian and Russian Mennonites (37%), and eastern Guarani Paraguayans (10%). Each of these communities has a very different culture, but they share the common bond of surviving in the Chaco and preserving its wildlife and natural resources for future generations.

Christine Andersen

Paraguayan teachers team up to conserve their natural resources.

A unique curriculum, *Raul's Adventures: The Threatened Ecosystems of the Paraguayan Chaco*, was developed by the Zoological Society of San Diego to provide knowledge and insight into this vulnerable ecosystem. Through the journal notes of a 10-year-old boy named Raul, teachers, students, and parents will learn about the ecologically rich environment they live in and how it faces extinction. The curriculum provides indoor and outdoor projects for fourth-grade students, teaching them to work together to conserve their environment and provide a healthy place to live for themselves and future generations. It is a curriculum with no cultural boundaries that focuses on the critical fact that without a healthy environment, all Chaqueños (the people who live in the Chaco) face extinction.

We hope to provide a useful tool for teachers in the Paraguayan Chaco that can be used throughout their teaching career. By discussing their environment and presenting examples, they can educate their students in science, social studies, communication, and health. In addition to supporting teachers, we want to provide students with the ability to problem-solve environmental issues and work toward making wildlife and human communities in the Chaco healthy and sustainable. Together we strive to weave a hopeful future for the next generation of Chaqueños.

—Christine Andersen, Conservation Education/Zoological Society of San Diego

Panda Update: Bai Yun's 2001 Artificial Insemination

Within 10 weeks of weaning her daughter, Hua Mei, our adult giant panda female came into estrus. As expected, Bai Yun had not cycled in 2000 because she was nursing Hua Mei. The giant panda team stepped into high gear at the end of March, when Bai Yun first began to show signs of impending estrus. Researchers from CRES' Reproductive Physiology, Behavior, and Endocrinology divisions met daily with staff veterinarians and panda keepers to review data collected in the previous 24 hours. On April 8, Bai Yun's behavior, vaginal cytology, and estrogen levels indicated that she had ovulated and it was time for insemination.

Because our male panda, Shi Shi, has shown no interest in breeding Bai Yun, artificial insemination was the only alternative. Shi Shi was anesthetized and brought to the Zoo hospital for semen collection, during which he produced enough motile sperm for three inseminations. While reproductive physiologists extended, counted, and analyzed the sperm, Shi Shi was taken back to the Zoo's Pacific Bell Giant Panda Research Station.

The semen was divided into three aliquots, one for immediate insemination and two for storage at 4 degrees Centigrade for the next two days. Then Bai Yun was anesthetized and brought to the hospital. Using equipment specially designed for the San Diego Zoo's panda, the semen was deposited nonsurgically into Bai Yun's cervix. The placement of the insemination catheter was verified by abdominal ultrasound. Veterinarians took the opportunity to perfect their ultrasound techniques to increase the likelihood that a fetus will be visualized early in gestation. (Bai Yun has been trained by her keepers to allow routine ultrasound examinations while munching nonchalantly on apples and carrots in a special cage behind her exhibit.) On April 9 and 10, artificial insemination with chilled semen was performed in exactly the same manner that successfully produced Hua Mei in 1999.

Unfortunately, there is no early pregnancy test developed for giant pandas yet, but CRES' analytical chemists and endocrinologists will be monitoring Bai Yun's urinary hormone levels in an attempt to identify signals indicative of pregnancy. The giant panda team is hopeful that Bai Yun will experience another successful pregnancy of approximately 135 days, giving birth late this summer.

–Barbara Durrant, Ph.D., Head, Reproductive Physiology Division/CRES

Helping College Students: The JoAnn B. Weedon CRES Educational Fund

More than a dozen years ago, Robert H. Weedon and his beloved late wife, JoAnn, enjoyed numerous visits to the Zoo and Wild Animal Park while they vacationed in San Diego from Florida. "We were very impressed with the Zoo and Wild Animal Park exhibits, the way staff cared for the animals, and the conservation work," recalled Robert. "JoAnn, who was already conservation conscious, was particularly energized about what the Zoo was doing for animals after a meeting and tour with the CRES director (the late Dr. Werner Heuschele). She felt that the Zoo was a worthwhile cause and wanted to help in some way."

The Peregrine Fund

Since those first visits, the Weedons have donated generously to the Zoological Society and its conservation efforts. And when JoAnn passed away in 1999, Robert established the JoAnn B. Weedon CRES Educational Fund in her memory. The Fund sponsors summer interns—young university students with an interest in conservation and research—and enables them to work on a variety of CRES projects. "I'm very happy that the Fund will be able to help students and give them the exposure and experience in the field of wildlife conservation," said Robert.

The first interns to be sponsored by the JoAnn B. Weedon CRES Educational Fund were recently selected by CRES staff and will begin their studies in June 2001. Jessica Hartley, a psychology major from Williams College in Massachusetts, will be monitoring the behavior of the ‘alala (also called the Hawaiian crow, pictured left), one of Hawaii's most critically endangered forest birds. Jessica will be trained to collect a variety of data on agonistic (aggressive), sexual, and nest-building behaviors from time-lapsed videotape recordings of the birds. Results from this study will help evaluate the interactions of newer ‘alala pairings so CRES scientists will better understand the effects of social maturity and mate compatibility on nesting and reproduction in this species.

The second intern is Leslie Platz, a zoology major from the University of California, Santa Barbara, who will help CRES researchers collect data on California condor chicks during their early rearing phase. Leslie will be trained on how to gather data from time-lapsed videotapes on parental care behaviors, nest box exchanges, and aggressive interactions between condors (seen above). This study will address the problem of condor mate compatibility as it relates to successful chick rearing for this endangered species.

Both interns also will receive training in preparing data for computer entry and preliminary analysis of the information, and they will write reports on what they learned from their valuable internships. "It's an excellent opportunity for the interns as well as for the Zoological Society, and it is definitely something JoAnn would have wanted to support," said Robert Weedon.

Investing in the Future of Our Endangered Wildlife

In the early 1980s, the Zoological Society of San Diego established a fund to provide a continual source of financial support for the CRES conservation and research efforts. The CRES Endowment began with an initial restricted gift of $190,000 and, through investment and the generosity of many individuals (such as the Weedons), corporations, and foundations, it's now more than $28 million!

A percentage of the income from investment of the CRES Endowment principal is distributed annually to provide significant support to the vital and groundbreaking research programs undertaken at CRES. Each contribution to the CRES Endowment helps secure the future of CRES programs and precious wildlife, such as rhinoceroses, giant pandas, and California condors, which our CRES researchers are striving to save all over the world.

Gifts of any size may be contributed to the CRES Endowment, and these may be made through outright gifts of cash and appreciated securities, or through designations in wills, trusts, and other estate planning devices.

If you would like more information on making a donation to the CRES Endowment, please contact Amy Parrott, Associate Director of Development, Major Gifts, at (619) 685-3213. You may also write to P.O. Box 120551, San Diego, CA 92112 or contact her via e-mail at aparrott@sandiegozoo.org.

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